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(54) TAP ASSEMBLY

(71) We, CHAFFOTEAUX ET MAURY, a body corporate organised under the laws of France of, 25, Avenue Marceau, 75116, Paris, France, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The invention concerns devices in the nature of tap assemblies for connecting a central heating circuit to a supply line for drinking water, hereinafter termed "mains water supply", in such a manner that the said circuit can be fed as required from the said supply and can be emptied, and that all connection between the circuit and the said supply can be cut off.

It should be remembered that tap assembly devices of the above type must prevent any possibility of water returning from the central heating circuit into the mains supply, which would introduce a risk of pollution of the water of the supply, at least in the two following cases:

—when the pressure of the mains water supply falls, or is even cut off, while the central heating circuit is being filled with water, and

—when, with the central heating installation operating normally with the tap closed, the tightness of the said tap is defective and the water pressure in the central heating circuit becomes greater than that of the mains water supply.

Thus, it is generally obligatory in devices of this type to include a non-return valve and two taps in series separated by a bypass which can be connected to open air through a third tap.

According to the invention there is provided a device for connecting a central heating circuit to a water supply comprising a three-way slide valve including a cylindrical casing with a lateral orifice forming a first port for connection to a water supply, the two longitudinal extremities of the said casing forming, respectively, a second port for connection to a central heating circuit and a third port for connection to open air; a valve for acting in conjunction with one of the longitudinal extremities of the casing; and a hollow piston or slide for sliding within the casing, this piston being able to take up a first extreme longitudinal position in which it ensures communication between the first and second ports through at least one port provided in its lateral wall while the valve remains removed from its seat, and a second extreme longitudinal position in which it applies the valve against its seat and puts the interior of the piston in communication with the third port.

In a preferred embodiment, the cylindrical casing is so orientated that its longitudinal extremity which can be connected to open air is at the bottom of the casing, the lower extremity of the piston, which is accessible from the outside, being sealed by a detachable plug. In order to replace the detachable plug, another plug which can be similarly adapted is provided on the lower extremity of the piston and includes, on the one hand, an upper rod able to displace the valve from its seat when this other plug is put in position and, on the other hand, a lower element for coupling to an evacuation line which communicates with the interior of the piston through the said other plug after it has been put in position. The two plugs can be formed into a single unit.

Preferably the valve is extended by a tail which extends axially within the hollow piston and ends in a widened extremity, and the piston has an internal bearing surface suitable to make contact with the said widened extremity in the second extreme longitudinal position of the piston.

[*Price 33p*]

The piston may have, on its extremity situated on the valve side, a hollow cylindrical ferrule, threaded externally, which is suitable to act in conjunction with an internally threaded boring in the extremity of the casing which faces it.

The cylindrical surfaces of the casing and the piston which face each other can be surfaces of revolution, that of the piston carrying three annular sealing rings, preferably toroidal, mutually staggered axially and suitable to act in conjunction with the surface of the casing facing them, the two sealing rings which are closest to that extremity of the casing able to be connected to free air closely enclosing the lateral port in the hollow piston in the axial direction. In such a preferred arrangement the said surface of the casing can include, between the lateral orifice in the said casing and its extremity able to be conneoted to free air, a section whose axial length is at least equal to the axial separation between the two said sealing rings.

In the following a preferred embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which: —

Figure 1 shows schematically a central heating installation fitted with a tap assembly device embodying the invention.

Figures 2 to 5 show this device in axial section in four different positions corresponding, respectively, to the filling of the central heating circuit, to the cutting-off of communication between the mains water supply and the interior of the piston of this device, to this position of cut-off together with the cutting-off of communication between the central heating circuit and the interior of the piston with the said interior connected to open air, and to the emptying of the central heating circuit.

The tap assembly device, denoted generally by the reference 1 in Figure 1, is a three-way tap with a first port 2 connected to the base of a closed central heating circuit 3 which includes, in a manner well known in itself, a driving pump 4, a heat generator 5, and at least one radiator 6.

The second port 7 is connected to a mains water supply 8 (drinking water under pressure), in this case through the intermediary of a sanitary water circuit 9 with a withdrawal tap 10 and a main stop valve 11.

The third port 12 is connected to open air.

More precisely the tap 1 includes a cylindrical body or casing 13, for example of brass, vertically orientated and having an upper axial extremity 14, a lateral orifice 15, and a lower axial extremity 16 which respectively constitute the three ports described above, a valve 17 which acts in conjunction with the extremity 14 of the body, which forms a seat for this valve, so as to give a tight seal, and a hollow piston or slide 18, for example of brass or plastics material, which can slide within an internal cylindrical bore 19 in the body 13.

The valve 17 is extended by a tail 20 fitted into the interior of the piston 18 and guided within this piston by means of two centering stars 21 and 22, which can slide within the cylindrical parts of the said piston. One of these stars 21, mounted at the extremity of the tail 20, comes to rest axially, at the end of the downward travel of the piston 18, against an internal annular shoulder 23 on this piston.

The piston is itself radially pierced by at least one small hole 24, preferably by a wreath of such small holes, and carries on external annular necks three toroidal sealing rings 25, 26 and 27 which can slide against the bore 19. The two rings 26 and 27 closely enclose the holes 24 axially and the ring 25 is situated at a considerable distance above these two rings.

The axial length of that section of the bore 19 which is included between the orifice 15 and the lower axial extremity of the said bore is slightly greater than the axial separation of the two rings 26 and 27.

The lower extremity 28 of the piston projects from the lower extremity of the body 13. The piston can be displaced vertically by manual manipulation of this extremity, which is milled on the outside.

In the preferred embodiment illustrated, this displacement is brought about by screwing, the upper extremity of the piston forming a hollow ferrule 29, with an exterior thread, able to act in conjunction with an internally-threaded section 30 of the body 13.

It would, however, also be possible to provide for a linear displacement of the piston with, if necessary, a bayonet-type seal, at least at the end of the upward travel, where, if necessary, a spring can assist the sliding of the piston in one direction.

In order that the orifice 15 in the body 3 shall be in communication with the holes 24 of the piston when these latter are at the level of the said orifice, an annular neck 31 is provided at this level either on the body 13, as illustrated, or on the piston, due precautions being taken to avoid contact between the toroidal rings and sharp edges, which are smoothed off for this purpose in any desired manner, particularly by shot blasting.

A plug 32 closes the bottom of the piston 18, preferably by screwing, a sealing joint 33 being interposed.

The mode of operation of the tap or valve assembly as described is as follows:

In order to fill the heating circuit, that is

to put the first two ports 14 and 15 into communication, the piston is set in its highest position (Figure 2), when the mains water in the said circuit will be caused to move successively in accordance with the arrows F_1 through the orifice 15, the neck 31, the holes 24, the interior of the piston 18, and the space between the valve 17 and its seat, the valve 17 being raised by the pressure of the mains water.

If, during this filling operation, the pressure of the supply is cut off or merely reduced to a value below that prevailing in the heating circuit, the valve 17 closes automatically, playing the role of a non-return valve.

In order to move from the filling position to that of total isolation of the heating circuit (Figure 4), it is sufficient to lower the piston 18 to its maximum extent, in the present case by unscrewing. During this operation the piston passes through the position illustrated in Figure 3.

In this intermediate position, the two toroidal rings 26 and 27 are both situated below the level of the orifice 15 and they both operate in conjunction with the cylindrical bore 19 in such a way as to isolate the interior of the piston from both the said orifice 15 and the lower axial extremity 16 of the body 13.

When the piston is in the said intermediate position, the tightness of the valve 17 can be checked very easily, the valve being at this time applied against its seat, where necessary compressing a joint 34, by its own weight and because the pressure of the supply no longer acts on the interior of the piston. In order to carry out the check it is sufficient to remove the plug 32 and to make certain that no leak remains after the contents of the piston have emptied.

When the piston returns to its lowest position (Figure 4), on the one hand, the shoulder 23 of the piston comes in contact with the star 21 and exerts a tensile force on it in the downward direction so as to apply the valve 17 against its seat with a sealing contact, and on the other hand, the holes 24 are opposed to an annular chamber 35 formed by a widening-out of the bore 19 at the bottom, which constitutes the extremity 16 open to air.

It should be noted that this communication between the holes 24 and the chamber 35 implies that the lower toroidal ring 27 no longer acts in conjunction with the bore 19, but this presents no difficulty since, as can be seen in Figure 3, the intermediate ring 26 has duly taken over the function of the ring 27 in ensuring the seal between the body 13 and the piston 18 below the orifice 15.

It results from the foregoing that the interior of the piston, on the one hand, is completely isolated from both the mains water supply and the central heating circuit and, on the other hand, empties its water content as shown by the arrows F_2.

In this way a capacity open to air is automatically interposed between the mains water supply and the central heating circuit, which ensures their complete separation.

In this position of the piston, which is the normal position when the central heating installation is in use, it is impossible for the water contained in the said installation to pollute the mains water supply.

In effect, if a leak occurs at the level of the valve 17, the heating water affected by the leak is drained directly through the piston 18, the holes 24, and the chamber 35.

If a leak occurs at the upper toroidal ring 25, the mains water under pressure affected by this leak also returns to the interior of the piston by means of the natural clearance between the threads 29 and 30, a clearance which may also be short-circuited by a groove or other appropriate conduit, for example a hole pierced radially in the threaded ferrule 29.

Finally, if a leak occurs at the intermediate ring 26, the mains water under pressure affected by this leak returns directly to the chamber 35, from which it is drained by gravity.

When the piston is in its intermediate position as shown in Figure 3, it is possible to carry out draining of the heating circuit as shown by the arrows F_3 (Figure 5) by pushing the valve 17 back towards the top as shown by the arrow H, by introducing a suitable rod under the valve. Means are advantageously provided to maintain the said rod automatically in the position in which it raises the valve until draining is completed.

In order to prevent the operator from getting the water which drains out downwards on his hands and "up his sleeve" until the time at which the rod is automatically locked it is possible, according to an advantageous variant, to replace the plug 32 by another plug which can be similarly fitted to the lower extremity of the piston and which has the following characteristics: on the one hand, it is extended upwards by a rod which is able to move the valve off its seat when the said other plug is put in position; on the other hand, the said other plug terminates at the lower end in a coupling onto which an evacuation pipeline, usually flexible, can easily be connected, the said coupling being in communication with the interior of the piston through the said plug after it has been put in position.

In an advantageous form, this other plug forms a single unit with the plug 32, the axes of the two plugs being, for example,

perpendicular to each other.

With another plug of this type, the water drained off is removed automatically through the evacuation pipeline which is coupled to it as soon as the valve is removed from its seat in order for the other plug to be mounted, the only volume of water which is evacuated by gravity before this mounting is complete corresponding to the small interior volume of the piston.

With the installation shown schematically in Figure 1, it is also possible to drain the sanitary water circuit 9, after closing the stop valve 11 and opening the withdrawal taps 10, by setting the piston in the position of Figure 2 and removing the plug 32.

As a result, a particularly simple tap assembly device is obtained which occupies little space, is certain and easy to operate and to mount, and allows all the operations necessary for the feeding of a central heating circuit from a mains water supply, for the complete isolation of the circuit, and for its draining to be carried out at will.

WHAT WE CLAIM IS: —

1. A device for connecting a central heating circuit to a water supply comprising a three-way slide valve including a cylindrical casing with a lateral orifice forming a first port for connection to a water supply, the two longitudinal extremities of the said casing forming, respectively, a second port for connection to a central heating circuit and a third port for connection to open air; a valve for acting in conjunction with one of the longitudinal extremities of the casing; and a hollow piston or slide for sliding within the casing, this piston being able to take up a first extreme longitudinal position in which it ensures communication between the first and the second ports through at least one port provided in its lateral wall while the valve remains removed from its seat, and a second extreme longitudinal position in which it applies the valve against its seat and puts the interior of the piston in communication with the third port.

2. A device according to Claim 1, wherein the piston has an extremity which projects out of the longitudinal extremity of the casing, opposite to that carrying the valve.

3. A device according to Claim 1 or 2, wherein the cylindrical casing is oriented in such a way that its longitudinal extremity which can be connected to open air is situated at the bottom of the casing.

4. A device according to Claim 3, wherein the lower extremity of the piston, which is accessible, is closed by a detachable plug.

5. A device according to Claim 4, provided with a second plug fitting like the first on the lower extremity of the piston and including, on the one hand, an upper rod able to remove the valve from its seat when this other plug is mounted in position and, on the other hand, a lower coupling element for connection to an evacuation pipeline communicating with the interior of the piston through the said other plug when it is mounted in position.

6. A device according to Claim 5, wherein the two plugs constitute a single unit.

7. A device according to any of the preceding claims, wherein the valve is extended by a tail which extends axially in the interior of the hollow piston and terminates in a widened end and that the piston includes an internal bearing surface for contacting the said enlarged extremity in the second extreme longitudinal position of the said piston.

8. A device according to any of the preceding claims, wherein the piston includes, at its end situated on the valve side, a hollow cylindrical ferrule with an external thread for acting in conjunction with a bore in the facing extremity of the casing, which has an internal thread.

9. A device according to any of the preceding claims, wherein the facing cylindrical surfaces of the casing and the piston are surfaces of revolution, and that of the piston carries three annular sealing rings, preferably toroidal, mutually staggered axially and adapted to act in conjunction with the facing surface of the casing, the two sealing rings closest to that extremity of the casing which can be connected to open air closely enclosing axially the lateral port in the hollow piston, and the said surface of the casing including between the lateral orifice in the said casing and the extremity of the casing which can be connected to open air a section whose axial length is at least equal to the lateral separation between the said two sealing rings.

10. A device for connecting a central heating circuit to a water supply, constructed substantially as herein described with reference to the accompanying drawings.

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2 SHEETS

the Original on a reduced scale

Sheet 1

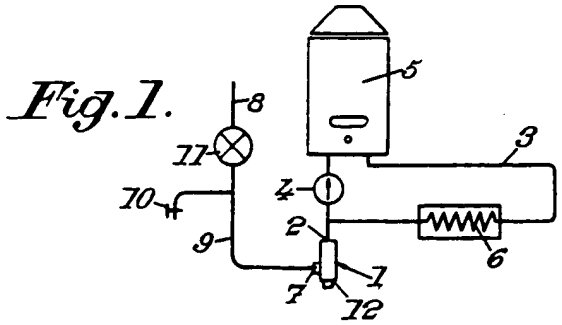

Fig. 1.

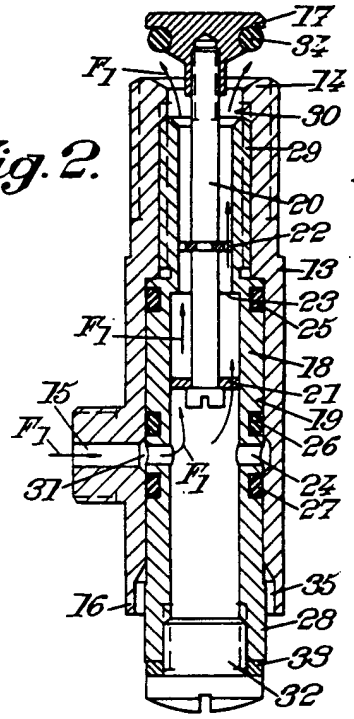

Fig. 2.

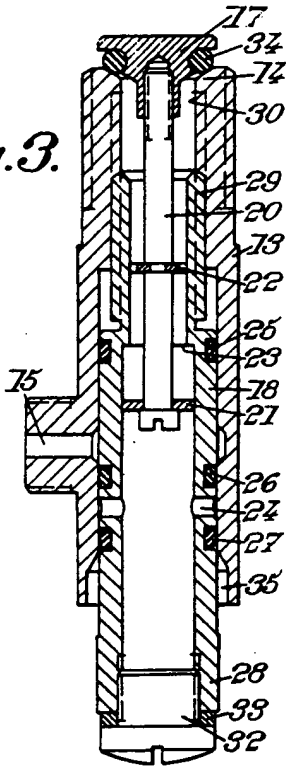

Fig. 3.